junction with said Schottky metal, said junction having a barrier potential energy level that is dependent upon the work function of said Schottky metal, said barrier height low enough to allow low forward voltage (V_f) operation of said diode.

B1 (Cont'd)

2. The diode of claim 1, wherein said barrier potential depends directly on said Schottky metal work function.

3. The diode of claim 1, wherein said n- doped GaN layer has an electron affinity, said barrier potential being approximately equal to said Schottky metal work function minus said electron affinity.

B2

6. The diode of claim 1, wherein said Schottky metal is one of the metals from the group comprising Cr, Nb, Sn, W, and Ta.

B3

15. A diode, comprising:

a layer of highly doped gallium nitride semiconductor material;

a layer of lower doped gallium nitride semiconductor material adjacent to the highly doped semiconductor material, said lower doped layer having an unpinned surface potential and an electron affinity; and

a Schottky metal layer on said lower doped semiconductor material, said Schottky metal having a work function, said lower doped semiconductor material forming a junction with said Schottky metal having a barrier potential energy level that is dependent upon the type of Schottky metal, said barrier potential being approximately equal to said work function minus said electron affinity, said barrier potential being of a magnitude that allows

B3 (cont'd)

said diode to operate as a low forward voltage (V_f) diode.

B4

19. The diode of claim 15, wherein said barrier potential has an energy level that depends directly on said work function of said Schottky metal.

20. The diode of claim 18, further comprising a substrate adjacent to said n+ doped GaN layer, opposite said n- doped GaN layer.

B5

22. The diode of claim 15, wherein said Schottky metal is one of the metals in the group comprising Cr, Nb, Sn, W and Ta.

B6

43. A Group III nitride based Schottky diode, comprising:

a Group III nitride based semiconductor material having an unpinned surface potential; and

a Schottky metal having a work function and forming a junction with said semiconductor material that has a barrier potential, the height of said barrier potential depending upon said work function, said diode operating as a low forward voltage diode.

B7

47. The diode of claim 43, wherein the height of said barrier potential which depends positively on said work function of said Schottky metal.

48. The diode of claim 45, further comprising a substrate made of sapphire (Al_2O_3), silicon carbide (SiC) or silicon (Si), adjacent to said n+ GaN layer, opposite said n- GaN layer.

49. The diode of claim 43, wherein said Schottky metal is